

lowering of sea level completely eliminated the continental shelf faunas (itself an unlikely prospect), oceanic islands would provide a safe haven for representatives of the great majority of today's shallow-marine benthic families; this indicates that the effects of areal reduction alone are insufficient to explain extensive familial extinction during the mass extinctions associated with regression.

Continental shelf bivalve and echinoid faunas have significantly more species per family than island bivalve and echinoid faunas (a proportion of 1.5:1 and 1.3:1, respectively), though gastropod faunas show no such difference. Gastropod faunas display persistently higher species-family ratios than bivalve faunas, and echinoid faunas have the lowest ratios of the three classes. Species-family ratios are diversity-dependent, so that island-continental and class-to-class differences in species-family ratios appear to be a

consequence of differing species richness among the faunas and classes.

The fossil record suggests that species richness within clades may not be an adequate measure of resistance to mass extinction. Tropical clades appear to suffer disproportionately during times of mass extinction, and in general species-rich clades are not better represented among survivors than species-poor clades. The linkage between speciation and extinction rates generates species-rich but evolutionarily volatile clades. Species richness within clades may, however, contribute to a clade's resistance to background extinction. That different factors contribute to extinction-resistance during times of mass vs. background extinctions suggest that macroevolutionary processes during those times are qualitatively as well as quantitatively different.

AVIAN MOLLUSCIVORES MINISYMPOSIUM

Arranged by David R. Lindberg
University of California

DESIGNER LIMPETS AND THEIR AVIAN CONSUMERS. Fred Sorenson, Moss Landing Marine Laboratories, California.

The limpet *Collisella pelta* has different shapes and forms on different substrata. Movement between substrata results in color patterns that make them conspicuous to avian predators. Transitional forms show up in higher proportions in Black Oystercatcher (*Haematopus bachmani*) middens than in the surrounding environment.

INTERTIDAL COMMUNITY STRUCTURE IN CENTRAL AND SOUTHERN CALIFORNIA: THE INTERACTION BE-

TWEEN HUMAN DISTURBANCE, BIRD PREDATION, AND LIMPET TERRITORIALITY. David R. Lindberg, James A. Estes, and Kenneth I. Warheit, Center for Coastal Marine Studies, University of California at Santa Cruz.

The presence or absence of the territorial limpet *Lottia gigantea* determines species diversity and abundances in the high and mid intertidal zones. The abundance of *L. gigantea*, in turn, is determined by the abundance of oystercatchers and humans. Humans also determine the abundance of oystercatchers.

ABSTRACTS SUPPORT SERVICES IN MALACOLOGY

A PROPOSED GENERALIZED MOLLUSCAN SHELL GROWTH MODEL: GASTROPOD MORPHOLOGY AND CONSTRUCTIONAL PATTERNS. Matthew J. James, Department of Paleontology, University of California, Berkeley.

The great diversity of molluscan shell form can be classified and analyzed using components of the proposed shell growth model. This is a descriptive model, not a mathe-

matical model or computer simulation, and is therefore based on empirical observations. Using gastropods as examples of complex constructional patterns, the model aids identification of temporal and spatial components of alteration in shell structure, ornamentation, and architecture. Two principal modes of calcium carbonate manipulation (deposition and resorption) are modified by four fundamental factors: 1)